

WHAT IS CLAIMED IS:

1. An image processing apparatus for processing color images, comprising:

a feature amount calculation section for calculating a feature amount with respect to a pixel of interest;

a background sensing section for sensing a background density or a background color with respect to a region surrounding the pixel of interest whose feature amount is calculated by the feature amount calculation section;

a plurality of character determination sections for determining whether the pixel of interest corresponds to a character or a line drawing on the basis of the feature amount calculated by the feature amount calculation section, said plurality of character determination sections using mutually different determination methods; and

a character determination selector section for selecting one of determination results output from the character determination sections in accordance with a sensing result output from the background sensing section.

2. An image processing apparatus according to claim 1, wherein different reference values are set to said character determination sections, and each of said character determination sections compares a reference

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value assigned thereto with the feature amount calculated by the feature amount calculation section, thereby determining whether the pixel of interest corresponds to the character or the line drawing.

- 5 3. An image processing apparatus according to
claim 1, wherein said feature amount calculation
section calculates a feature amount of the pixel of
interest by using a first region defined surrounding
the pixel of interest, and said background sensing
10 section senses a background density or a background
color regarding a region surrounding the pixel of
interest by using a second region which is similar in
size to the first region or greater than the first
region.

15 4. An image processing apparatus according to
claim 1, wherein said background sensing section senses
the background density or background color by using
only those pixels which the determination result
selected by the character determination selector
section regards as an object other than the character
20 or line drawing.

25 5. An image processing apparatus according to
claim 1, wherein said feature amount calculation
section calculates the feature amount on the basis of
density gradients or distances in a color space between
pixels detected in different directions with respect to
a predetermined region surrounding the pixel of

interest.

6. An image processing apparatus according to
claim 1, wherein said background sensing section
prepares a histogram regarding a density detected in a
5 predetermined region surrounding the pixel of interest,
and determines that a sensed density is a background
density when the sensed density is within a range that
is lower than a predetermined value, and when the
sensed density repeatedly appears more than a
10 predetermined number of times and the number of times
the sensed density appears is largest.

7. An image processing apparatus according to
claim 1, wherein:

when the background sensing section fails to
15 detect the background density or background color of a
character, the background sensing section outputs a
sensing result signal indicating that a background
sensing operation results in failure;

said plurality of character determination sections
20 include at least one character determination section
that determines whether the pixel of interest
represents a character or a line drawing by using a
determination method suited to a case where the
background density or the background color cannot be
25 detected; and

when said character determination selector section
receives from the background sensing section the signal

indicating that the background sensing operation results in failure, said character determination selector section selects a determination result output from said at least one character determination section,
5 which determines whether the pixel of interest represents a character or a line drawing by using a determination method suited to a case where the background density or the background color cannot be detected.

10 8. An image processing apparatus according to claim 1, wherein:

 said background sensing section senses whether the background of a character is white or a color other than white;

15 said plurality of character determination sections include a character determination section for determining whether a pixel represents a character or a line drawing by using a determination method suited to a case where the background is white, and a character determination section for determining whether a pixel represents a character or a line drawing by using a determination method suited to a case where the background is other than white; and
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 said character determination selector section selects a determination result output from the character determination section that determines whether a pixel represents a character or a line drawing by

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using the determination method suited to the case where the background is white, when the background of the character is sensed as being white by the background sensing section, and selects a determination result output from the character determination section that determines whether a pixel represents a character or a line drawing by using the determination method suited to the case where the background is other than white, when the background of the character is sensed as being other than white by the background sensing section.

9. An image processing apparatus according to claim 1, wherein said background sensing section is a low-pass filter, and said feature amount calculation section is a high-pass filter.

15 10. An image processing apparatus for processing
color images, comprising:

a plurality of feature amount calculation sections for determining feature amounts with respect to a pixel of interest by using mutually different determination methods;

a background sensing section for sensing a background density or a background color with respect to a region surrounding the pixel of interest whose feature amount is calculated by the feature amount calculation sections;

a feature amount selection section for selecting one of calculation results output from the feature

amount calculation sections in accordance with a sensing result output from the background sensing section; and

a character determination section for determining whether the pixel of interest is a character or a line drawing on the basis of a feature amount selected by the feature amount selection section.

11. An image processing apparatus according to claim 10, wherein said feature amount calculation section calculates a feature amount of the pixel of interest by using a first region defined surrounding the pixel of interest, and said background sensing section senses a background density or a background color regarding a region surrounding the pixel of interest by using a second region which is similar in size to the first region or greater than the first region.

12. An image processing apparatus according to claim 10, wherein said background sensing section senses the background density or background color by using only those pixels which the determination result selected by the character determination selector section regards as an object other than the character or line drawing.

25 13. An image processing apparatus according to claim 10, wherein said plurality of feature amount calculation sections include at least one feature

amount calculation section that calculates the feature amount on the basis of density gradients or distances in a color space between pixels detected in different directions with respect to a predetermined region
surrounding the pixel of interest.

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14. An image processing apparatus according to claim 10, wherein said background sensing section prepares a histogram regarding a density detected in a predetermined region surrounding the pixel of interest,
10 and determines that a sensed density is a background density when the sensed density is within a range that is lower than a predetermined value, and when the sensed density repeatedly appears more than a predetermined number of times and the number of times
15 the sensed density appears is largest.

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15. An image processing apparatus according to claim 10, wherein:

when the background sensing section fails to detect the background density or background color of a character, the background sensing section outputs a sensing result signal indicating that a background sensing operation results in failure;

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said plurality of feature amount calculation sections includes at least one feature amount calculation section that calculates the feature amount of the pixel of interest by using a calculation method suited to a case where the background density or the

background color cannot be detected; and

said feature amount selection section selects a calculation result output from the feature amount calculation section that is included among said plurality of feature amount calculation sections and that calculates the feature amount of the pixel of interest by using the calculation method suited to the case where the background density or the background color cannot be detected.

16. An image processing apparatus according to claim 10, wherein:

said background sensing section senses whether the background of a character is white or a color other than white;

said plurality of feature amount calculation sections include a feature amount calculation section for calculating the feature amount of the pixel of interest by using a calculation method suited to a case where the background is white, and a feature amount calculation section for calculating the feature amount of the pixel of interest by using a calculation method suited to a case where the background is other than white; and

said feature amount selection section selects a calculation result output from the feature amount calculation section for calculating the feature amount of the pixel of interest by using the calculation

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method suited to the case where the background is white,
when the background of the character is sensed as being
white by the background sensing section, and selects a
calculation result output from the feature amount
5 calculation section for calculating the feature amount
of the pixel of interest by using the calculation
method suited to the case where the background is other
than white, when the background of the character is
sensed as being other than white by the background
10 sensing section.

17. An image processing apparatus according to
claim 10, wherein said background sensing section is a
low-pass filter, and said feature amount calculation
section is a high-pass filter.

15 18. An image processing apparatus for processing
color images, comprising:

a feature amount calculation section for
calculating a feature amount with respect to a pixel of
interest;

20 a background sensing section for sensing a
background density or a background color with respect
to a region surrounding the pixel of interest;

a plurality of color determination sections for
determining colors with respect to the pixel of
25 interest on the basis of a chroma and/or a hue thereof,
said color determination sections using mutually
different determination methods; and

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a color determination selector section for
selecting one of determination results output from the
color determination sections in accordance with the
feature amount the feature amount calculation section
5 determines with respect to the pixel of interest or the
background density or color the background sensing
section senses.

19. An image processing apparatus according to
claim 18, wherein different reference values are set to
10 said color determination sections, and each of said
color determination sections compares a reference value
assigned thereto with the chroma and hue of the pixel
of interest, thereby determining the color of the pixel
of interest.

15 20. An image processing apparatus according to
claim 18, wherein said plurality of color determination
sections includes at least one color determination
section that compares a chroma and/or a hue of a
highest-density pixel of a predetermined region
surrounding the pixel of interest with reference values,
20 thereby determining the color of the pixel of interest.

21. An image processing apparatus according to
claim 18, wherein said feature amount calculation
section calculates the feature amount on the basis of
25 density gradients or distances in a color space between
pixels detected in different directions with respect to
a predetermined region surrounding the pixel of

interest.

22. An image processing apparatus according to
claim 18, wherein said background sensing section
prepares a histogram regarding a density detected in a
5 predetermined region surrounding the pixel of interest,
and determines that a sensed density is a background
density when the sensed density is within a range that
is lower than a predetermined value, and when the
sensed density repeatedly appears more than a
10 predetermined number of times and the number of times
the sensed density appears is largest.

23. An image processing apparatus according to
claim 18, wherein:

when the background sensing section fails to
15 detect the background density or background color of a
character, the background sensing section outputs a
sensing result signal indicating that a background
sensing operation results in failure;

said plurality of color determination sections
20 includes at least one color determination section that
determines the color of the pixel of interest by using
a determination method suited to a case where the
background density or the background color cannot be
detected; and

25 said color determination selector selects a
determination result output from the color
determination section that is included among said

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plurality of color determination sections and that
determines the color of the pixel of interest by using
the determination method suited to the case where the
background density or the background color cannot be
detected, when said color determination selector
section receives from the background sensing section
the signal indicating that the background sensing
operation results in failure.

24. An image processing apparatus according to
claim 18, wherein:

said background sensing section senses whether the
background of a character is white or a color other
than white;

said plurality of color determination sections
include a color determination section for determining
the color of the pixel of interest by using a
determination method suited to a case where the
background is white, and a color determination section
for determining the color of the pixel of interest by
using a determination method suited to a case where the
background is other than white; and

said character determination selector section
selects a determination result output from the color
determination section for determining the color of the
pixel of interest by using the determination method
suited to the case where the background is white, when
the background of the character is sensed as being

white by the background sensing section, and selects a determination result output from the color determination section for determining the color of the pixel of interest by using the determination method suited to the case where the background is other than white, when the background of the character is sensed as being other than white by the background sensing section.

25. An image processing apparatus according to
10 claim 18, wherein said background sensing section is a low-pass filter, and said feature amount calculation section is a high-pass filter.

26. An image processing apparatus for processing color images, comprising:

15 a feature amount calculation section for calculating a feature amount with respect to a pixel of interest;

20 a character determination section for determining whether the pixel of interest is a character or a line drawing on the basis of a feature amount calculated by the feature amount selection section; and

25 a color determination section for determining the color of the pixel of interest by comparing a chroma and/or a hue of a highest-density pixel of a predetermined region surrounding the pixel of interest with reference values.